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(56) Documents cited  
WO 89/12483 A1 US 4145053 A US 4006907 A  
US 3990708 A US 3908173 A US 3578333 A

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(54) Golf practice apparatus

(57) A green on a driving range has automatic ball collection means, comprising suitable slopes of the various portions of the green 10, gullies 14 at the bottom of the slopes, and one or more ball collection points at the ends of the gullies. A water supply 15 to the gullies assists the movement of the balls along the gullies, and tubing 16, 17 returns the balls to the tee. The green is divided into a plurality of regions each of which is provided with means for detecting balls landing therein, by a suitable arrangement of the slopes and gullies and/or a plurality of sensing means located along the gully or gullies. The balls may be counted mechanically, or may carry bar codes or transponders; in the latter case, the green may have a plurality of sensing loops formed or buried therein.

Fig. 1

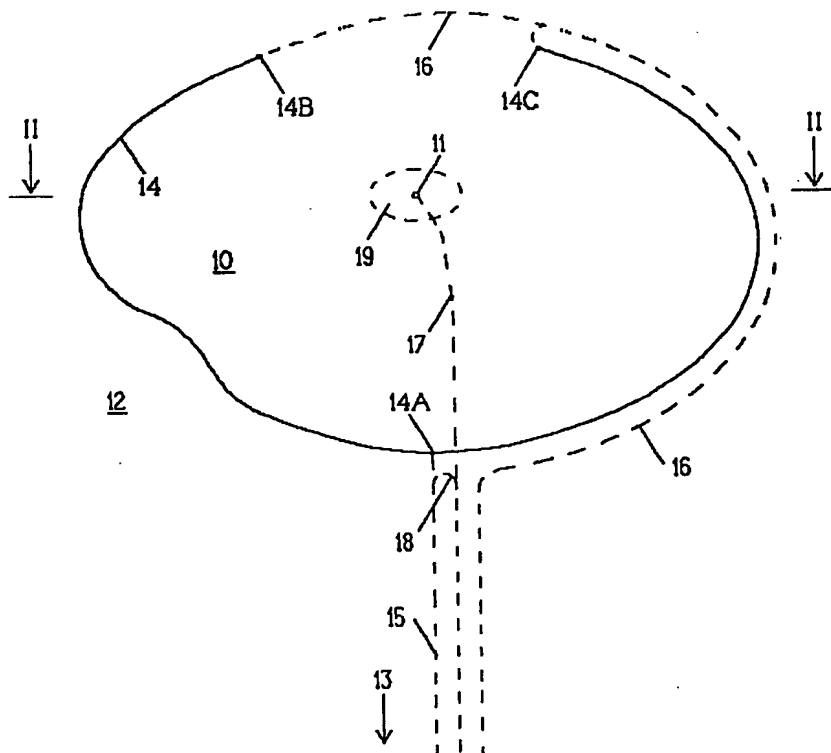


Fig. 1

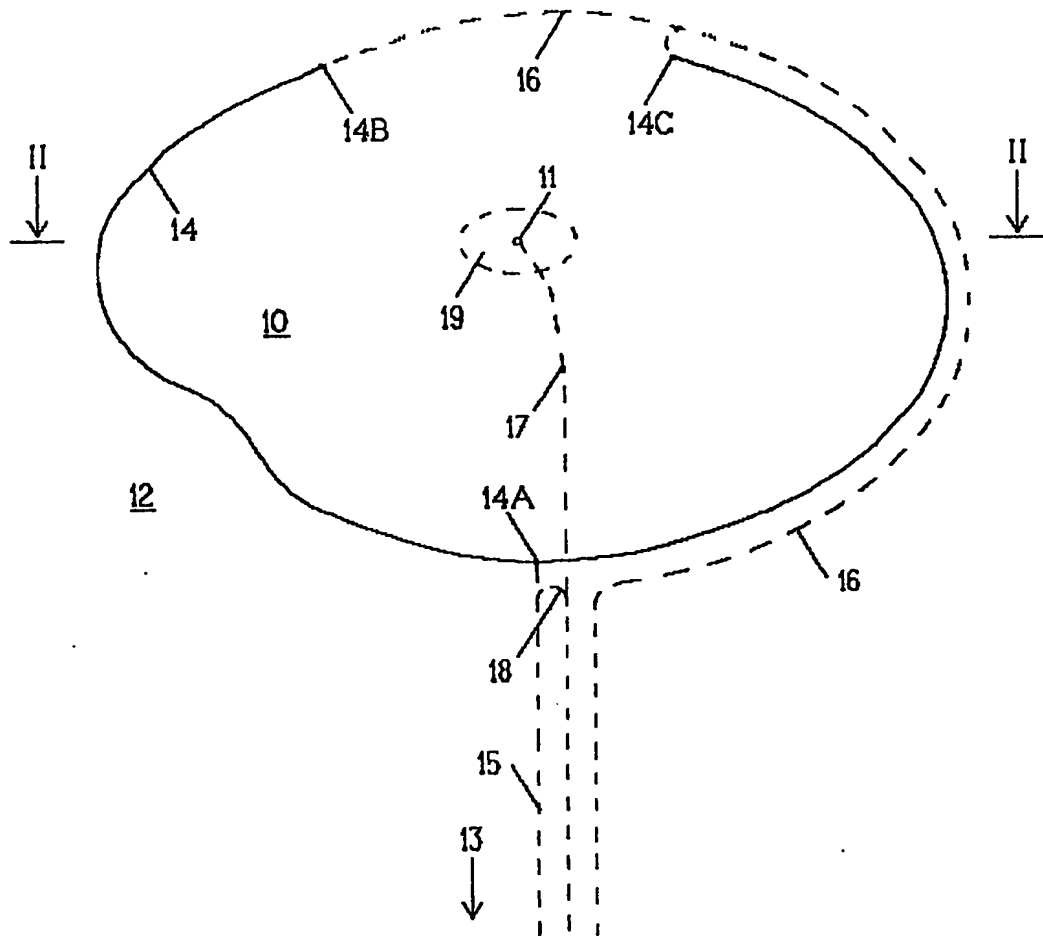
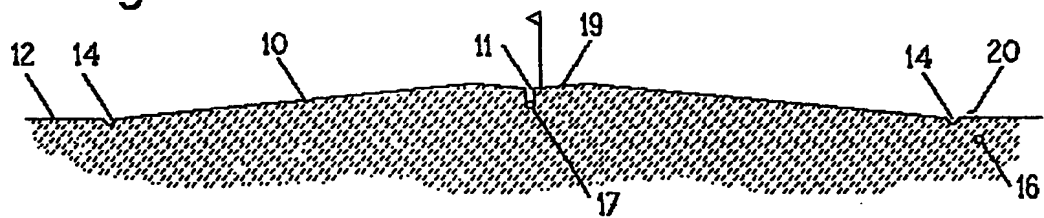
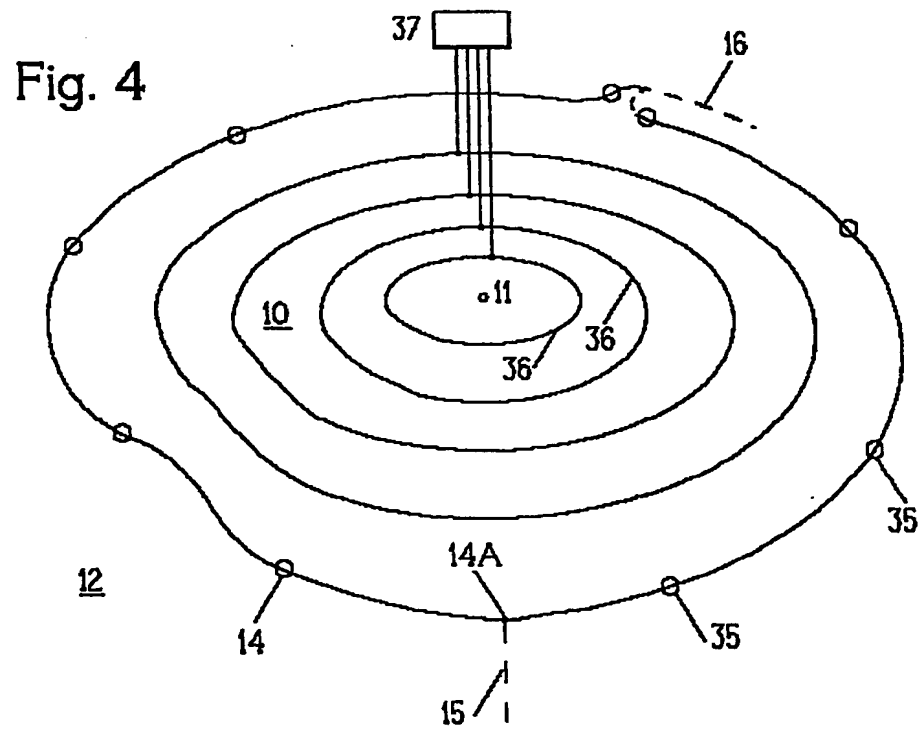
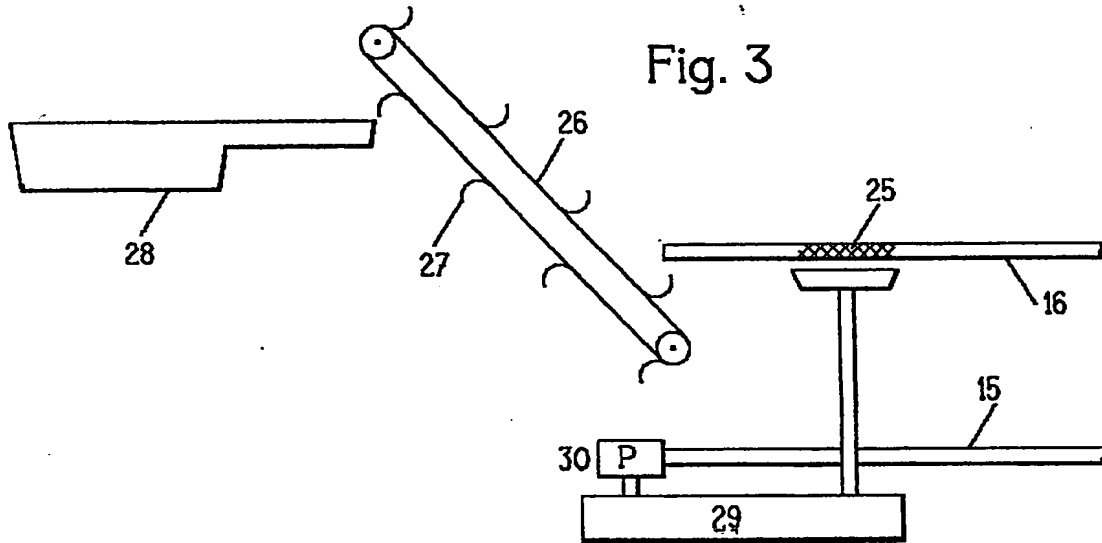


Fig. 2





## **Golf Practice Apparatus**

The present invention relates to golf practice apparatus, and more specifically to practice driving ranges.

The game of golf requires skill in many aspects of ball control. One of these aspects is driving in the broad sense - ie sending the ball over a long distance to (or towards) a green, chips, approach shots, &c. Golf driving ranges have been developed to allow concentrated practising of this.

Such a driving range normally consists of a number of "bays" laid out in parallel. A bay consists of a tee-like area and, at a suitable distance from it, a target area simulating a green. The golfer stands at the tee and drives a substantial number of balls towards the green. At the end of the session, they usually simply leave (with the balls being collected later by the range operator). It is possible for them to go to the green to inspect more closely where their balls have landed and pick them up; however, this is normally discouraged or forbidden, partly because of the danger from wild balls from adjacent bays.

We have realized that while this arrangement does indeed allow the practising of driving, it has substantial drawbacks, a major one of which is that the accuracy of the driving is difficult or impossible to judge. (By this, we mean the accuracy of a properly hit drive; a hook or slice can usually be recognized easily.)

The main object of the present invention is to provide an improved golf driving range in which the accuracy of driving can be better estimated.

Accordingly the invention provides a golf driving range in which the green is divided into a plurality of regions and detector means are provided for determining which region a ball lands in.

The regions may be defined by a set of sensing lines buried in the green and operating in conjunction with transponder devices contained within the balls. The lines may be in the form of loops each defining a region, but are preferably

arranged radially from and circumferentially around the hole, so that each region is defined by four lines.

Such a system is however essentially static, and is somewhat demanding technically on the sensitivity required for effective detection of the balls within the regions. It is therefore preferred that the green should have slopes such that the balls roll down the slopes once they have landed, giving a dynamic system. The division of the green into a plurality of regions may be achieved at least partially by a suitable arrangement of the slopes and gullies, with a plurality of sensing means located along the gully or gullies. The balls may be counted mechanically.

The balls may be provided with indicating means enabling them to be distinguished as well as sensed. As described above, the indicating means may be transponders, included inside the balls, which can be electronically sensed. The collection points may be provided with suitable sensors and counters.

Alternatively or additionally, the green may have a plurality of sensing loops formed or buried therein, as described above. The combination of circumferential sensing lines and detectors past which the balls move as a result of the slopes and/or gullies allows the radial distance of the landing point of the ball from the hole to be determined by the sensing loops, and the angular segment in which it landed to be determined later by sensing means at the bottom of the slopes or in the gullies.

The use of slopes and gullies effectively provides the green with means for automatically collecting balls landing thereon. A water supply to the gullies may be provided to assist the movement of the balls along the gullies. The collection points may be connected to tubing for returning the balls to the tee.

A golf driving range embodying the invention will now be described, by way of example, with reference to the drawings, in which:

Fig. 1 is a plan view of the green;

Fig. 2 is a section through the green along the line II-II;

Fig. 3 is a side view of the ball separation and collection system; and

Fig. 4 shows an elaboration of the green.

Fig. 1 shows the green 10 having a central hole 11 and surrounded by an area 12 representing bunkers, fairway, &c. The tee (not shown) is a suitable distance away in the direction 13. The green can conveniently be grass (turf), though artificial grass can be used.

The green 10 is defined and delimited by a collection gully 14, which is fed with water at a point 14A via a buried supply pipe 15 and slopes slightly downward in both directions from that point to its ends 14B and 14C. These ends feed into a buried pipe 16, which runs adjacent to the supply pipe 15 and has a slight downward slope to the tee. The hole 11 is connected to a further buried pipe 17, which runs adjacent to the pipes 15 and 16 and has, like pipe 16, a slight downward slope to the tee. Supply pipe 15 may have a branch 18 feeding pipe 17.

As shown in Fig. 2, the green 10 is raised in the centre and slopes gently downward toward the gully 14. A ball from the tee landing on the green will therefore roll down into the gully. Once there, it will be carried round to one or other end 14B and 14C by the flow of water along the gully from the supply pipe 15, and once it reaches the end of the gully, it will enter the pipe 16 and be carried back along it to the tee. A ball entering the hole 11 will similarly be carried back along the pipe 17 to the tee.

The green 10 preferably also has a general slope downward toward the tee. This will increase the apparent depth of the green from front to back. (For this, it may be convenient for the slope of the gully 14 and the water flow in it to be reversed, ie for the water to enter at the ends 14B and 14C and the return pipe to be at the point 14A.)

The green may have a slight depression 19 around the hole 11, to increase the effective area of the hole.

If desired, a ball stop gully (not shown) may be provided immediately outside the collection gully 14. (A second gully and collection pipe may be provided for these if desired.) Alternatively, a ball stop ridge 20 may be provided, as shown in Fig. 2. This will prevent balls which miss the green 10 completely and land on the surrounding area 11 from being collected and returned.

Fig. 3 shows diagrammatically the ball separation and collection system, which is located at or near the tee. The pipe 16 has a perforated section 25 to separate and drain off the water flowing through it. The balls continue to the end of the pipe, and are collected in a container 28. The water drained off at 25 passes into a reservoir 29, which feeds a pump 30 which provides the water flow into the supply pipe 15.

Pipe 17 will of course have a similar perforated section (draining into the reservoir 29) and container (not shown).

If the driving range has a sufficient slope upward from the tee to the green, the end of the pipe 15 can feed directly into the container 28. Often, however, a ball lifting mechanism will be required. This mechanism can conveniently consist of an endless belt 26 carrying cups 27 and driven to raise the balls appropriately. There will be two adjacent lines of cups, so that the same band will lift balls from both pipes 16 and 17 into their respective containers.

The driving range may have several bays, all of similar construction. These will preferably share a common reservoir, pump, and ball lifting mechanism.

The system as described so far is purely hydraulic and mechanical, and discriminates only between balls falling in the central or hole area 19, those falling on the rest of the green 10, and those falling outside the green at 11. Greater discrimination may be provided by providing more gullies. However, this increases the complexity of the green, and decreases its resemblance to greens on real golf courses.

The discrimination can also be increased by effectively splitting the gully 14 into sections. The simplest way of doing this is to have the sections feed separate collection pipes back to the tee. However, this involves multiple pipework. It may therefore be preferable to place sensors 35 (Fig. 4) at suitable positions along the gully 14, to detect the passage of the balls, with the sensors sending back electrical signals to the tee.

The sensing can be done purely mechanically, by detecting the passage of balls (eg by the provision of flaps which are displaced by the balls, or optical sensors). However, it is preferred to provide the balls with indicating means which can be readily sensed. (This also makes it easier for the system to

distinguish between a single ball passing several sensors on the one hand and several balls on the other.)

The indicating means may be bar codes printed on the balls. The technology for reading bar codes in a variety of orientations is well developed, and the bar code can be printed at several locations on a ball.

Alternatively, the indicating means may be transponders buried in the balls. It is relatively simple to provide several detecting stations at different points along the gully. The transponders can be either permanently coded or programmable.

The use of transponders allows a more detailed location or discrimination of the position where the ball lands. For this, detector wires must be buried in the green 10. One technique is to cover the green with a network of wire loops, each with an area of the order of say 1 m<sup>2</sup>. It is however more convenient to provide a set of roughly concentric loops 36 of different sizes around the hole 11, together with a sensing circuit 37 which will detect the passage of a ball over a loop. (The loops 36 may be multiplexed to the sensing circuit.) This will provide an indication of the distance of the ball from the hole; the direction or bearing of the ball from the hole can then be determined, when the ball reaches the gully, by the sensors 35 arranged along the gully.

The results can be indicated on an indicator board (not shown) at the tee, which may be either an announcement board or a graphic display board, and/or printed out at the end of the session.

Summarizing, a green on a driving range has automatic ball collection means, comprising suitable slopes of the various portions of the green 10, gullies 14 at the bottom of the slopes, and one or more ball collection points at the ends of the gullies. A water supply 15 to the gullies assists the movement of the balls along the gullies, and tubing 16, 17 returns the balls to the tee. The green is divided into a plurality of regions each of which is provided with means for detecting balls landing therein, by a suitable arrangement of the slopes and gullies and/or a plurality of sensing means located along the gully or gullies. The balls may counted mechanically, or may carry bar codes or transponders; in the latter case, the green may have a plurality of sensing loops formed or buried therein.



## Claims

1 A golf driving range in which the green is divided into a plurality of regions and detector means are provided for determining which region a ball lands in.

2 A golf driving range according to claim 1 in which the plurality of regions are defined at least partially by suitable slopes of the various portions of the green, one or more gullies at the bottom of the slopes, and a plurality of sensing means located along the gully or gullies.

3 A golf driving range according to claim 1 in which the plurality of regions are defined at least partially by a plurality of electronic sensing lines buried in the green, the balls including transponders which can be electronically sensed.

4 A golf driving range according to claims 1 and 2 together, the electronic sensing lines being generally circumferential.

5 A golf driving range according to either of claims 2 and 4, in which the balls are detected mechanically in the gullies.

6 A golf driving range according to any previous claim in which the balls are provided with indicating means enabling them to be sensed and distinguished.

7 A golf driving range according to claim 6 in which the indicating means are bar codes.

8 A golf driving range according to claim 6 in which the indicating means are transponders which can be electronically sensed.

9 A golf driving range according to claim 2 or any claim dependent thereon wherein the gullies are fed with water to assist the passage of balls therealong.

10 A golf driving range according to claim 2 or any claim dependent thereon and including means for returning balls from the gullies to the tee.

11 A golf course according to claims 9 and 10 together, wherein the means for returning balls from the gullies to the tee comprise a water pipe.

12 A golf driving range in which the green is provided with collection means for automatically collecting balls landing thereon.

13 A golf driving range according to claim 12 in which the collection means comprise suitable slopes of the various portions of the green and one or more gullies at the bottom of the slopes.

14 A golf driving range substantially as herein described.

15 Any novel and inventive feature or combination of features specifically disclosed herein within the meaning of Article 4H of the International Convention (Paris Convention).

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

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**Relevant Technical fields**

(i) UK Cl (Edition L ) A6D (D39X)

(ii) Int Cl (Edition 5 ) A63B 69/36

**Search Examiner**

D W WHITFIELD

**Databases (see over)**

(i) UK Patent Office

(ii)

**Date of Search**

8 JULY 1993

Documents considered relevant following a search in respect of claims 1-11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	WO 89/12483 A1 (BEARD) Whole document	1
X	US 4145053 (HEALEY) Whole document	1
X	US 4006907 (HEFFLEY) Whole document	1
X	US 3990708 (INGWERSON) Whole document	1,2,10
X	US 3708173 (HEWSON) Whole document	1,2,10
X	US 3578333 (ELESCH) Whole document	1

Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

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